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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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David L. O'Meara

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EXAMINER

DHINGRA, RAKESH KUMAR

ART UNIT

PAPER NUMBER

1792

NOTIFICATION DATE

DELIVERY MODE

07/02/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/813,119	<b>Applicant(s)</b> O'MEARA ET AL.	
	<b>Examiner</b> RAKESH K. DHINGRA	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 March 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15, 17-40 and 42-45 is/are pending in the application.
- 4a) Of the above claim(s) 10-15, 18-28, 32-38, 40 and 42-44 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-9, 17, 29-31, 39 and 45 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 9/7/06 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***DETAILED ACTION***

***Response to Arguments***

Applicant's arguments with respect to claims 1, 2-9, 16, 17, 29-31, 39, 41 and 45 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended claim 1 by adding new limitations (for example in claim 1 – “quartz” and “metal”).

Claims 1-15, 18-40 and 42-45 are now pending, out of which claims 1-9, 17, 29-31, 39 and 45 are presently active.

New reference by Nakata (US 5,119,761) when combined with Toya et al, Kato et al and Kaneko et al reads on amended claim 1 limitations including newly added limitations.

Accordingly claims 1-9 and 39 have been rejected under 35 USC 103 (a) as explained below.

Further, balance claims 17, 29-31 and 45 have also been rejected under 35 USC 103 (a) as explained below.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1-9, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata (US 5,119,761) in view of Toya et al (US 6,043,468), Kato et al (US 5,609,689) and Kaneko et al (US 5,223,113).**

Regarding Claim 1: Nakata teaches a substrate holder assembly comprising:  
wafer heating assembly comprising:

a holding device (substrate table) 106, 108 (made from quartz and Al<sub>2</sub>O<sub>3</sub> respectively), and a backside surface opposing the wafer support surface, the holding device comprising a recess (wherein the heater 109 is disposed) each having a middle portion extending along the wafer support surface, and end portions that extend to openings in said backside surface (e.g. Fig. 12 and col. 1, line 31 to col. 2, line 25). Further, though Nakata teaches that the heater portion 109 is made from aluminum oxide, it is known in the art to use quartz and aluminum oxide interchangeably. Also, though Nakata teaches only one recess, the number of recesses would be dependent upon number of heaters to be installed, as per required temperature profile.

Nakata does not teach the holding device having quartz raised portions thereon, which are configured to support a wafer;

a plurality of heating units mounted in the recess, wherein each heating unit comprises:

a quartz tube extending along said middle and end portions of the respective recess and having a carbon wire heater comprising a carbon fiber bundle, the carbon wire heater having a middle section sealed within the tube and opposing ends that extend to an exterior of the tube, wherein at least one of the tube or an opposing end of the carbon wire heater extends through one of said openings on the backside surface of the holding device, and connecting terminals coupled to the opposing ends of the carbon wire heater;

a quartz thermal barrier adjacent to said backside of the holding device, the thermal barrier comprising a thermally variable material and a reflecting surface facing the plurality of heating units;

a metal cooling unit coupled to the back side of the holding device such that said thermal barrier is interposed between the cooling unit and the heating unit, said cooling unit configured to cool said wafer;

a quartz coupling unit coupled to the cooling unit and configured to mount the substrate holder to a processing chamber and having a lower thermal conductivity than the heating assembly and cooling unit.

Toya et al teach a carbon heater assembly for semiconductor manufacturing apparatus comprising a carbon wire heater 151 comprising carbon fiber bundle sealed in a quartz tube 156, with opposite ends of heater wire connected to terminals 154 (e.g. Figs. 37, 38 and col. 28, line 63 to col. 29, line 35). It would be obvious to replace the heater in Nakata's apparatus with the

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quartz tube enclosed and sealed carbon fiber heater as taught by Toya et al to obtain an improved heating unit that can withstand rapid temperature changes during plasma processing.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide a quartz tube enclosed carbon fiber heater as taught by Toya et al in the apparatus of Nakata to obtain an improved heating unit that can withstand rapid temperature changes during plasma processing.

Nakata in view of Toya et al do not teach wafer support surface comprising quartz having raised portions, a quartz thermal barrier with a reflecting surface adjacent to holding device and disposed between the heating unit and a metal cooling unit, and a quartz coupling unit coupled to the cooler unit and configured to mount the substrate holder to a processing chamber.

Kato et al teach a wafer processing apparatus comprising a wafer support surface comprising quartz (support members 20) and quartz raised portions 21 for supporting a wafer W. Kato et al further teach that the apparatus further comprises a heater unit 13 with a reflector 16, a cooling unit 17 and a coupling unit 18 (for example, Figure 1 and column 3, line 42 to column 4, line 35) {Claim limitation “wafer support surface having quartz raised portions” is interpreted that raised portions could be part of either a cover or the top surface of the quartz holding device}.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide a wafer support surface having quartz raised portions, and a cooling unit with a coupling unit as taught by Kato et al in the apparatus of Nakata in view of Toya et al to avoid direct contact of wafer with the wafer support surface, and temperature control of wafer by the cooling unit enabling compactness of the processing chamber.

Nakata in view of Toya et al and Kato et al do not teach a quartz thermal barrier with a reflecting surface adjacent to backside of the holding device and disposed between the heating unit and the metal cooling unit, metal cooling unit and quartz coupling unit.

Kaneko et al teach a wafer processing apparatus comprising a heating unit with a heater 53, a cooling unit 20 and a thermal barrier 56 made of a thermally variable material (quartz) and disposed between the heating and cooling units and having reflecting surface facing the heating unit 54 and having coupling (insulating) units 22 configured to mount the substrate holder assembly to the chamber frame 32b. {having lower thermal conductivity than cooling unit 17 (aluminum – Kato et al) and heating unit (quartz - Kato et al). Kaneko et al also teach that insulating coupling units can be made from ceramic (which could include quartz) such that the coupling unit would have a lower thermal conductivity than the cooling unit (made from aluminum, Kato et al – col. 3, lines 60-67). Further, insulating unit would obviously have lower thermal conductivity than heating unit (depending upon type of quartz used) to avoid overheating/overcooling of chamber frame 32b [for example, Fig. 2 and col. 4, lines 1-45].

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide a quartz thermal barrier having a reflecting surface and disposed between the heating unit and the cooling unit as taught by Kaneko et al in the apparatus of Nakata in view of Toya et al and Kato et al to provide thermal isolation between the heating and the cooling units.

Regarding Claims 2-9: Toya et al teach that the heater could have various shapes like straight, curved etc. It would be obvious to shape the heater as per size and profile of the substrate and the required temperature distribution (Figs. 5, 13, 34-39).

Regarding Claim 39: Nakata in view of Toya et al, Kato et al and Kaneko et al teach a single heating unit on a single holding device. It would be obvious to duplicate the wafer heating assembly (including holding device with corresponding heating units) to increase through-put during wafer processing.

In this connection it has been ruled by courts (Case law):

“Duplication of parts was held to have been obvious. *St. Regis Paper Co. v. Beemis Co. Inc.* 193 USPQ 8, 11 (1977); *In re Harza* 124 USPQ 378 (CCPA 1960).”

**Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata (US 5,119,761) in view of Toya et al (US 6,043,468), Kato et al (US 5,609,689) and Kaneko et al (US 5,223,113) as applied to claims 1-9, 39 and further in view of Szekeresch et al (US 6,919,538).**

Regarding Claim 17: Nakata in view of Toya et al, Kato et al and Kaneko et al teach all limitations of the claim except temperature sensor coupled to substrate holder.

Szekeresch et al teach an apparatus (Figure 1) that includes a base plate (substrate holder) 3 for holding substrate S and having grooves 7 that help divide the underside of plate 3 into plurality of square shaped heating elements 10 and where each heating element (that is substrate holder) is provided with temperature sensors (not shown in figure) (column 4, lines 10-50).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to provide a temperature sensors with holding device as taught by Szekeresch et al in the apparatus of Nakata in view of Toya et al, Kato et al and Kaneko et al to enable monitor the temperature of holding device.



**Claims 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata (US 5,119,761) in view of Toya et al (US 6,043,468), Kato et al (US 5,609,689) and Kaneko et al (US 5,223,113) as applied to claims 1-9, 39 and further in view of Takahashi et al (US 6,106,628).**

Regarding Claim 29: Nakata in view of Toya et al, Kato et al and Kaneko et al teach all limitations of the claim except a cover coupled to the holding device.

Takahashi teach an apparatus (Figure 1) that includes a wafer heating assembly comprising:

a base (holding device) B with susceptors 8, 9 and having a plurality of grooves (recesses) 14, the base (holding device) having turntables (wafer supports) 2, 3 configured to support a wafer 1;

a plurality of heating units 4, 5 disposed in respective grooves (recesses) 14 wherein at least one heating unit comprises heater 13;

rotary shafts 6, 7 to which turn-tables are attached on a common axis of rotation C.

Takahashi further teach that heaters 13 are resistive heaters and are enclosed by quartz cover plate 16. Takahashi also teach turn-tables 2, 3 (like cover) coupled to the base (holding device) B {Figure 1 and column 2, line 15 to column 3, line 5}.

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide a cover for being coupled to holding device as taught by Takahashi in the apparatus of Nakata in view of Toya et al, Kato et al and Kaneko et al to enable provide transmission of thermal energy from the heaters and also provide mechanical protection to the heaters.

Regarding Claim 30: Kato et al teach raised portions 21 to avoid direct contact between wafer and the substrate support. It would be obvious to provide such raised portions on the cover (as taught by Takahashi) to provide gap between the wafer and the cover surface in view of teaching of Kato et al.

Regarding Claim 31: Nakata in view of Toya et al, Kato et al and Kaneko et al teach raised portions on the wafer support surface (as already explained above under claim 1). Further it is known in art to use a temperature sensor as one of the substrate supporting pins (raised portion) on a substrate support surface.

**Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata (US 5,119,761) in view of Toya et al (US 6,043,468), Kato et al (US 5,609,689) and Kaneko et al (US 5,223,113) as applied to claims 1-9, 39 and further in view of Schaper et al (US 6,353,209).**

Regarding Claim 45: Nakata in view of Toya et al, Kato et al and Kaneko et al teach all limitations of the claim except alternate cooling mechanism corresponding to carbon wire heating elements to increase speed of thermal response and configured to flow gas or other coolant fluid.

Schaper et al teach an apparatus (Figure 4A, 7A-C) that includes a thermal processing module 50 for temperature control of substrate 10 and includes heating elements 56 whose temperature can be independently controlled and further includes a cooling plate (cooling mechanism) 62 that helps to cool or control the ramp rate of individual heating elements [column 3, line 20 to column 4, line 10 and column 5, line 5 to column 6, line 55).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to provide cooling mechanism as taught by Schaper et al in the apparatus of Nakata in view of Toya et al, Kato et al and Kaneko et al to achieve desired temperature profiles during substrate processing.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAKESH K. DHINGRA whose telephone number is (571)272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rakesh K Dhingra/  
Examiner, Art Unit 1792

/K. M./  
Primary Examiner, Art Unit 1792